

**TWO NEW SPECIES OF *TRAPEZITES* HÜBNER
(LEPIDOPTERA: HESPERIIDAE: TRAPEZITINAE)
FROM EASTERN AUSTRALIA**

Andrew Atkins

The University of Newcastle, Newcastle, NSW 2308

Abstract

Trapezites genevieveae sp. nov. and *Trapezites taori* sp. nov. are described from the Great Dividing Range of eastern Australia. They inhabit particular biomes adjacent to those of closely related species, particularly *T. praxedes* (Plötz) and *T. symmopus* Hübner which have more extensive distributions along the coast and hinterlands. The adults and juveniles of both new species are illustrated and compared with their nearest allies.

Introduction

Several closely related species-groups of the endemic genus *Trapezites* Hübner occur along the coastal and sub-coastal regions of eastern Australia. They inhabit a wide variety of woodlands and heaths from sea-level to 1600 m (Common and Waterhouse 1981). Most species are widely distributed but local to certain biomes within their range. In the southern areas of Victoria and montane areas of New South Wales to northern Queensland they are univoltine; at lower altitudes from coastal New South Wales to northern Queensland they are generally bivoltine or multivoltine, some species flying throughout the year (Dunn and Dunn 1991).

With the exception of a few Western Australian species (Williams *et al.* 1992, Mayo and Atkins 1992, Williams and Atkins 1997), the larval foodplants of *Trapezites* are species of *Matrush* (*Lomandra*: Xanthorrhoeaceae), the larvae generally feeding at night and pupating within leaf litter near the base of the foodplant (Atkins 1987).

Trapezites have very similar dark brown and orange or yellowish maculation on the upperside of the wings but the species can be distinguished by a subtle variation of patterns and ground colour on the underside of the hindwing. Juveniles are distinguished by morphology and by colour patterns of the larval head and pupal cap (operculum). Adult taxonomic characters of the antennal club, wing venation and genitalia further separate the species and species-groups.

Four closely related taxa, *T. phigalioides* Waterhouse, *T. iacchoides* Waterhouse, *T. maheta* (Hewitson) and *T. praxedes* (Plötz), plus a fifth more distantly related species *T. symmopus* Hübner, are found along the moist coastal or montane heaths and woodlands along the Great Dividing Range. The latter three taxa are widely distributed throughout temperate and/or subtropical biomes in eastern Australia.

From 1989-1996 a series of pale trapezitine larvae was collected from a species of *Lomandra* growing at altitudes between 200-800 m in the dense subtropical and temperate rainforests of central montane New South Wales

and southern Queensland. The larvae, pupae and the subsequently reared adults were compared with those of a series of *T. praxedes* from central coastal New South Wales and southern Queensland. The rainforest specimens differ both in structure and biology from *T. praxedes* but the adults resemble specimens collected earlier (1911, 1967-68) at two localities adjacent to rainforest in New South Wales. Consistent characters of behaviour and structure distinguish the rainforest populations from *T. praxedes* and *T. maheta*. Biological and distributional observations have added to the evidence that they represent a distinct species.

In 1972-73 and 1995-96 several specimens of an unusual *Trapezites* were collected at an elevation of 900 m on the Blackdown Tableland, Expedition Range, central Queensland (see Atkins 1974). Both sexes show a close affinity with *T. symmopus* but are somewhat smaller and duller. The habitat at this location is mixed heath and woodland. Other central Queensland records include a specimen observed at Springsure by the late J.C. Le Souëf (1975) and another collected at Isla Gorge in 1991 by R. Eastwood (pers. comm.). These areas are west of the nearest recorded locality for *T. symmopus* at Kroombit Tops, near Gladstone. *T. symmopus* is known also from the Eungella Range west of Mackay (Valentine 1988, Braby 1994), with reared specimens collected from *Lomandra longifolia* (pers. obs.).

The described subspecies of *T. symmopus*, *T. s. soma* Waterhouse from Victoria and *T. s. sombra* Waterhouse from north Queensland, differ to only a limited degree from the typical subspecies from central coastal Queensland (including Kroombit Tops) and probably represent a cline. The species occurs in a variety of habitats from coastal heaths to montane woodlands where mostly it is univoltine. The larvae feed on several species of *Lomandra*, particularly *L. longifolia*. Morphological, biological and distributional comparisons of these phenotypes indicate that the inland central Queensland populations are specifically distinct.

Methods

Most *Trapezites* can be reared on a range of species of *Lomandra* under laboratory conditions although sometimes the adults are smaller (pers. obs., n=15 spp., 300-350 specimens). Adult female *Trapezites* were collected in the field and placed in net-covered pots containing various species of *Lomandra* and fed for 3-5 days with water and honey mixture. Eggs were collected from the leaves of the foodplant, leaf litter placed around the pots and from the netting.

Abbreviations

Abbreviations of collections where specimens are housed, are as follows: ANIC, Australian National Insect Collection Canberra; BMNH, The Natural History Museum, London; NMVM, National Museum of Victoria, Melbourne; AA, Andrew Atkins collection; RE, Rod Eastwood collection; RM, Russell Mayo collection. Rearing details are given as follows: RXE = reared from egg; RXL = reared from larvae.

Key to males of the *maheta* and *symmomus* species groups

- 1 Adults medium to large (forewing length 17-20 mm), hindwing underside yellowish-brown, reddish-brown or pale greyish-brown with silver or whitish spots 5
 - Adults medium to small (forewing length 12-16 mm), hindwing underside dark grey and greyish-brown to purple-brown, silver spots absent or present 2
- 2 Hindwing underside with dark spots, prominently centred with silver scales 3
 - Hindwing underside with broadly ringed dark spots centred with grey scales *phigalioides*
- 3 Hindwing underside with the two central (median) silver spots moderate and distally placed, with pointed forewing and termen comparatively straight 4
 - Hindwing underside with the two central (median) silver spots large and basally located, with forewing short and termen usually comparatively rounded *maheta*
- 4 Hindwing underside grey to greyish-brown, 2 median and 2 or 3 subternal silver spots; forewing underside with grey inner margin *praxedes*
 - Hindwing underside brown to purplish-brown, 2 median and 5 or 6 subternal to apical silver spots; forewing underside with yellow inner marginal smudge *genevieveae* sp. nov.
- 5 Hindwing underside dark brown or yellow-brown, the central (median) silver spot large 6
 - Hindwing underside pale grey-brown, with 2 median and 7 or 8 subternal to apical medium to small brown-ringed silver spots *iacchoides*
- 6 Hindwing underside dark reddish-brown, subternal to apical spots prominent *symmomus*
 - Hindwing underside dull yellowish-brown, subternal to apical spots obscured *taori* sp. nov.

Key to females of the *maheta* and *symmomus* species groups

- 1 Adults medium to large (forewing length 20-25 mm), hindwing underside yellowish-brown, reddish-brown or pale greyish-brown, with silver or whitish spots 5
 - Adults medium to small (forewing length 15-19 mm), hindwing underside dark grey and greyish-brown to purple brown, with or without whitish spots 2
- 2 Hindwing underside with smallish dark spots centred with grey scales 3
 - Hindwing underside with broadly ringed dark spots centred with grey scales *phigalioides*

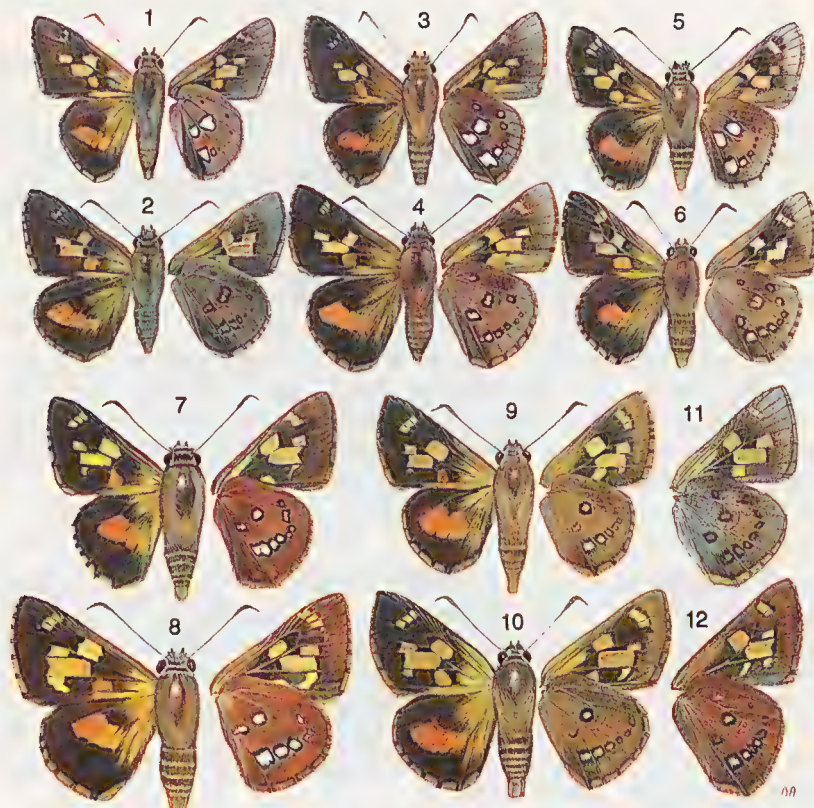
- 3 Forewing pointed and termen comparatively straight 4
 Forewing short and termen comparatively rounded *maheta*
- 4 Hindwing underside grey to greyish-brown with small dark spots;
 forewing underside with pale grey inner margin *praxedes*
 Hindwing underside rich greyish-brown with prominent dark spots,
 often centred with whitish scales; forewing underside with pale
 yellow inner margin *genevieveae* sp. nov.
- 5 Hindwing underside dark brown or yellow-brown, the central
 (median) spot large 6
 Hindwing underside pale grey-brown, with 2 median and 7 or
 8 subternal to apical medium to small brown-ringed silver
 spots *iacchoides*
- 6 Hindwing underside dark reddish-brown, subternal to apical spots
 prominent *symmopus*
 Hindwing underside dull yellowish-brown, subternal to apical
 spots obscured *taori* sp. nov.

Females of *T. phigalioides*, *T. maheta*, *T. praxedes* and *T. genevieveae* are difficult to distinguish and somewhat variable. Some characters overlap, but those presented above are consistent in fresh (or reared) specimens.

Trapezites genevieveae sp. nov.

(Figs 3-4, 13-14, 25-27, 31-32, 34-41)

Types. NEW SOUTH WALES: *Holotype* ♂, Barrington Lodge, RXL, 1.xi.1989, A.F. Atkins (ANIC, genitalia dissected). *Paratypes*: 1 ♀, Mt Allyn (River), RXL, 26.xi.1992, A.F. Atkins (ANIC); 1 ♀, Bruxner Park, Coffs Harbour, 28.x.1993, A.F. Atkins (ANIC); 1 ♀, Bruxner Park, Coffs Harbour, RXL, 2.xi.1993, A.F. Atkins (BMNH); 1 ♀, Bruxner Park, Coffs Harbour, RXE, 28.xi.2995, A.F. Atkins (RM); 2 ♀, Middle Brother, 29.xii.1994; 1 ♂, Barrington Lodge (Salisbury), RXL, 12.xi.1992; 1 ♀, Barrington Lodge, Williams River, RXL, 16.xi.1990; 1 ♂, 3 ♀, Barrington Lodge, RXL, 26.x.1990, 21.xi.1992, 1.xii.1992 & 27.xii.1992; 1 ♂, 2 ♀, Wilson River, RXL, 29.xi.1992 & 18.xii.1992; 1 ♂, 1 ♀, 'Grandis', 20km NE of Bulahdelah, RXL, 4.i.1995 & 2.xii.1995; 1 ♂, 1 ♀, Copeland, RXL, 17.x.1994 & 5.xi.1994; 1 ♂, Mt Allyn, RXL, 15.xi.1992; 1 ♂, 2 ♀, Allyn River, RXL, 1.xii.1992, 2.xii.1992 & 7.xii.1992; 1 ♂, Allyn River, Barrington area, RXL, 21.xi.1992; 1 ♀, Upper Allyn, Barrington Range, RXL, 5.xii.1990; 1 ♀, Gloucester River, RXL, 22.xi.1992; 2 ♂, O'Sullivan's Gap, Bulahdelah, 12.xii.1994; 1 ♀, O'Sullivan's Gap, RXL, 2.xii.1995; 1 ♂, 3 ♀, Bruxner Park, Coffs Harbour, RXL, 25.x.1993, 4.xi.1993, 17.xi.1993 & 16.xi.1994; 3 ♂, 1 ♀, Bruxner Park, Coffs Harbour, RXE, 1.xi.1995 & 28.xi.1995; 1 ♂, 2 ♀, Bruxner Park, Coffs Harbour, 7.i.1993 & 29.xii.1994; 5 ♂, 5 ♀, Dorrigo, RXL, 2.x.1993, 8.x.1993, 12.x.1993, 19.x.1993, 21.x.1993, 29.x.1993, 4.xi.1993, 16.xi.1993 & 29.ix.1993; 1 ♂, 1 ♀, Boorganna Reserve, Comboyne, RXL, 26.x.1995 & 28.xi.1995; all reared or collected by A.F. Atkins (all AA). QUEENSLAND: 1 ♀, Mt Glorious, RXL, 25.xii.1994, A.F. Atkins (AA).



Figs 1-12. Adult *Trapezites* spp. (1-10, upperside left, underside right; 11-12, underside): (1) *T. praxedes* male, Catherine Hill Bay, NSW; (2) *T. praxedes* female, Port Stephens, NSW; (3) *T. genevieveae* male, Barrington Lodge, NSW; (4) *T. genevieveae* female, Mt Allyn, NSW; (5) *T. maheta* male, Busby Flat, NSW; (6) *T. maheta* female, Byfield, Qld; (7) *T. s. symmopus* male, Narrara, NSW; (8) *T. s. symmopus* female, Dudley, NSW; (9) *T. taori* male, Blackdown Tableland, Qld; (10) *T. taori* female, Blackdown Tableland, Qld; (11) *T. praxedes* female, Mt Glorious, Qld; (12) *T. symmopus sombra* male, Herberton, Qld. Scale bar = 10 mm.

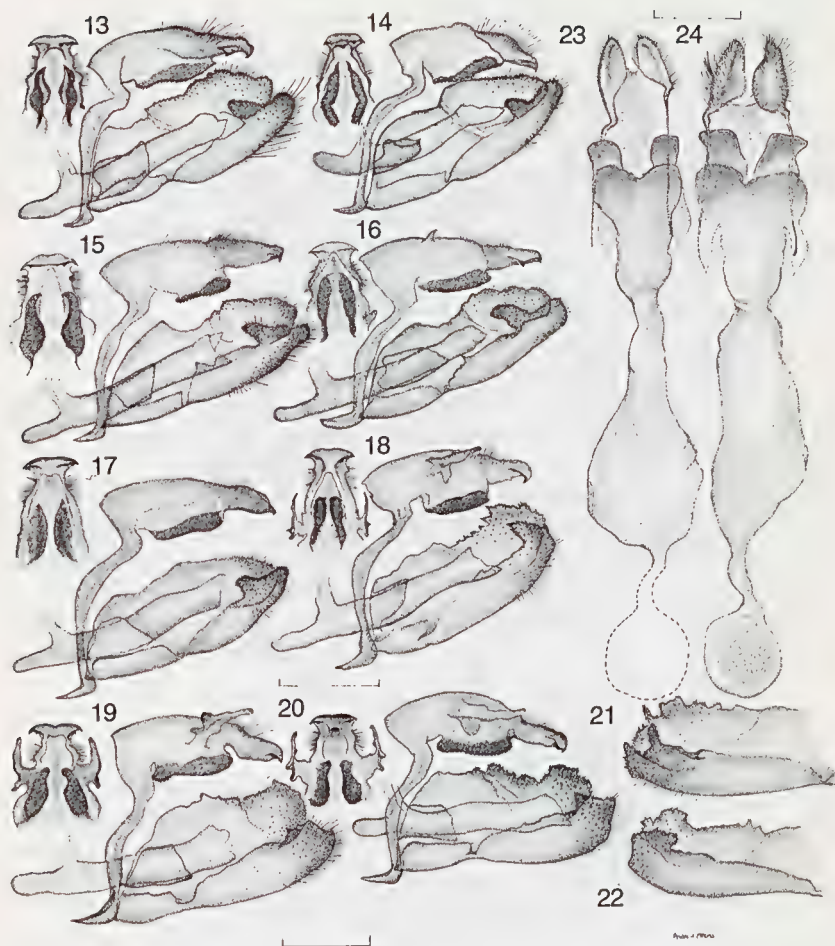
Description. Male (Fig. 3). Head, labial palpi and anterior of thorax above covered with brown hairs, below covered with pale cream hairs, posterior of thorax and abdomen covered with yellow, brown and pale brown hairs, below covered with light fawn hairs; eyes dark brown; antennae with shaft and base of club black, segmented with pale yellow scales; below club pale yellow; nudum (24 segments) rust coloured. Forewing above: length 17-18 mm; ground colour dark reddish-brown to black, costa and base of discal cell covered with reddish brown scales, base of wing and inner margin with patch of yellow-orange hairs; sub-elliptical patch of yellow scales in submedian area between $1A+2A$ and CuA_2 ; a hyaline yellowish wedge-shaped subcostal spot in cell; a small hyaline quadrate spot in postmedian area between CuA_1

and M_3 , a larger wedge-shaped hyaline spot between CuA_1 and CuA_2 , three small subapical hyaline spots; cilia pale brown. Hindwing above: ground colour dark reddish-brown to black, base and anal vein area with long yellow-orange hairs, central median-postmedian area with irregular patch of bright yellow-orange scales and hairs; cilia pale yellowish-brown from apex to pale orange at tornus. Forewing below: ground colour pale reddish-brown, base and central area black; inner margin area greyish-brown and adjacent area above $1A+2A$ (variable from tornal area to submedian area) covered with pale yellow scales. Hindwing below: ground colour greyish-brown to black at tornus, central area pale reddish-brown; two large sub-crescent median silver spots in cell and between $1A+2A$ and CuA_2 ; one large subtornal quadrate silver spot between $1A+2A$ and CuA_2 and two smaller subterminal silver spots between CuA_2 and CuA_1 and CuA_1 and M_3 ; two small obscure dark brown subterminal spots between M_3 , M_2 and M_1 ; two postmedian silver spots between M_1 , Rs and $Sc+R_1$.

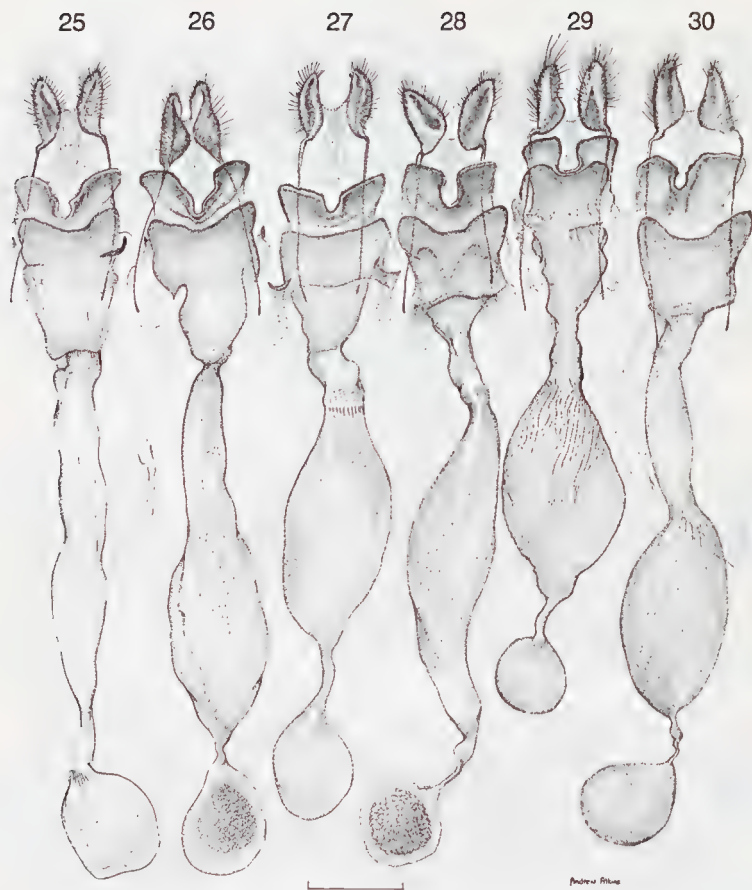
Male genitalia (Figs 13-14). Combined tegumen and uncus long, distally crinose, projecting to simple toothed uncus tip (see inset, Figs 13-14); lateral flanges absent; gnathos sclerotized and slightly projecting; saccus short and curved. Valvae long, quadriform to oval, distally pointed, sclerotized and crinose; ampulla rounded (in left valva, slightly decurved and broadly blunt); sacculus curved and sclerotized to upcurved harpe (blunt in left valva); long, bent, proximally placed dorsal process; aedeagus long, broad and simple with wide postzone; juxta saddle-shaped.

Female (Fig. 4). As in male but forewing more convex, length 17-20 mm, hyaline spots generally larger. Hindwing more convex, upperside central bright yellow-orange patch broad across wing. Forewing below with grey terminal and subterminal area between M_1 and CuA_1 ; pale yellow scales above $1A+2A$ prominent and extending generally across wing. Hindwing below pale greyish-brown with central area and tornal area orange-brown; a band of eight dark brown postmedian-subterminal spots variably centred with white scales between $1A+2A$ and $Sc+R_1$; a dark brown spot centred white near base of $Sc+R_1$ and Rs ; a double white-centred spot near proximal end of cell; two white-centred dark brown submedian spots between $3A$, $1A+2A$ and CuA_2 .

Female genitalia (Figs 25-27). Papilla analis long, craticular and crinose with long straight apophysis; lamella post-vaginalis broadly spaced and V-shaped covered with minute setae; lamella ante-vaginalis broad, quadriform, slightly depressed at centre; ductus bursae and caudal chamber narrow; corpus bursae



Figs 13-24. Male and female genitalia of *Trapezites* spp. (inset = slightly enlarged dorsal view of uncus): (13) *T. genevieveae* HT, Barrington Lodge, NSW; (14) *T. genevieveae*, Bruxner Park, NSW; (15) *T. praxedes*, Whitebridge, NSW; (16) *T. praxedes*, Mt Binga, Qld; (17) *T. maheta*, Gympie, Qld; (18) *T. taori*, Blackdown Tableland, Qld; (19) *T. symmopus*, Eungella, Qld; (20) *T. symmopus*, National Park (Sydney), NSW; (21) inside left valva *T. taori* HT, Blackdown Tableland, Qld; (22) inside left valva *T. symmopus*, National Park (Sydney), NSW; (23) female genitalia *T. taori*, Blackdown Tableland, Qld; (24) female genitalia *T. symmopus*, Mt Dromedary, NSW. Scale bars = 1 mm (inset of uncus slightly larger).



Figs 25-30. Female genitalia of *Trapezites* spp: (25) *T. genevieveae*, Mt Allyn, NSW; (26) *T. genevieveae*, Middle Brother, NSW; (27) *T. genevieveae*, Mt Glorious, Qld; (28) *T. praxedes*, Mt Glorious, Qld; (29) *T. praxedes*, Caves Beach, NSW; (30) *T. maheta*, Byfield, Qld. Scale bar = 1 mm.

long, broadly ovoid and slightly sclerotized; accessory pouch large and ovoid.

Variation. Populations vary slightly in adult size and in the number and size of the underside hindwing spots of the male. These spots tend to be larger and prominent in southern populations, whereas in the north the spots between Sc+R₁ and Rs are occasionally absent. The yellowish smudge along

1A+2A is always present on the underside of the forewing in both sexes but it is variable in size in the male. The white-centred spots on the underside of the hindwing of the female are variable in size and sometimes absent. Larvae and pupae vary little in colour although northern specimens tend to be slightly darker.

Etymology. The species is named for the artist and field/photographic assistant Genevieve Wallace, whose help, advice and research with this skipper and many other Hesperiidæ in London, Germany, Kenya, Hong Kong and Costa Rica have been greatly appreciated and invaluable.

Distribution. Confined to the eastern slopes of the Great Dividing Range east of a line from Scone, New South Wales to Cunningham's Gap and Montville, Queensland. In the south it is found from widely scattered montane areas of temperate and subtropical old-growth rainforest of the Barrington Ranges to the near-coastal forests surrounding Bulahdelah, north through the hinterlands of montane New South Wales to the Border Ranges and in elevated rainforests near Brisbane north to the Nambour district of southern Queensland. Additional localities (larval records) have been found throughout the range of this rare skipper; they include: Tallowood Forest, Cabbage-tree Mountain (north-west of Bulahdelah), North Brother (near Laurieton), the hinterland of Wauchope and Kempsey, the Nightcap Range, Minyon Falls and Terania Creek (all north-west of Lismore), Lamington Plateau and Binna Burra areas in the Border Ranges, Cunningham's Gap and Kondilla National Park, Montville.

Trapezites taori sp.nov.

(Figs 9-10, 18, 21, 23, 42-43, 45-48)

Types. QUEENSLAND: *Holotype* ♂, Blackdown Tableland, Expedition Range, Central Queensland, 26.viii.1973, A.F. Atkins (ANIC). *Paratypes*: 2 ♂, same locality, 23.ix.1973 & 24.ix.1973, J.C. Le Souëf; 6 ♂, 7 ♀, same locality, 16.ix.1972, 23.ix.1972, 22.ix.1973, 22.ix.1973, 26.ix.1973, 27.ix.1973, 27.iv.1974, 27.iv.1974, 26.ix.1974, 27.ix.1974 & 27.x.1974, A.F. Atkins (all ANIC); 9 ♂, 2 ♀, same locality, 20.viii.1995, 21.viii.1995, 22.viii.1995 & 23.viii.1995, A.F. Atkins (all AA); 1 ♂, same locality, 23.viii.1995, A.F. Atkins (RM); 1 ♂, Isla Gorge South, Central Queensland, 31.iii.1990, R. Eastwood (RE).

Description. Male (Fig. 9). Head, labial palpi and anterior of thorax above covered with brown hairs edged paler brown, thorax and abdomen covered with greyish-yellow hairs, abdominal hair tuft tipped yellow; below labial palpi and anterior of thorax with pale cream hairs, remainder covered with cream and fawn hairs, reddish-orange at abdominal tip; eyes dark brown. Antennal shaft and club above black, nudum (29 segments) orange-brown; below club pale orange-brown. Forewing above: length 19-21 mm; ground colour dark brown, base of discal cell and costa covered with orange-brown scales; base of wing and inner margin with patch of yellow-orange hairs;

subelliptical patch of yellow scales in submedian area between $1A+2A$ and CuA_2 ; a hyaline yellowish wedge-shaped subcostal spot in cell; a small hyaline quadrate spot in postmedian area between CuA_1 and M_3 ; a large wedge-shaped hyaline spot between CuA_1 and CuA_2 ; a small, often obscured crescentic spot of orange scales in postmedian area immediately below CuA_2 ; three small subapical hyaline spots; cilia pale yellowish-brown. Hindwing above: ground colour dark brown, base and anal vein area with long yellow hairs, central median-postmedian area with an irregular patch of bright yellow scales and hairs; cilia yellow-orange, darker at tornus. Forewing below: ground colour yellowish-brown, base and central area dark brown; inner margin area greyish-brown; hyaline spots and yellowish spots as above but paler and slightly larger, smudged in spot between CuA_1 and CuA_2 . Hindwing below: ground colour yellowish-brown, paler in central area, a curved row of 6 dark brown-black spots, centred bluish-grey, tapering down between $1A+2A$ and Rs ; a large central black spot, centred with bluish-grey scales.

Male genitalia (Figs 18, 21). Combined tegumen and uncus long, extending to a simple, flared dentate tip (see inset, Fig. 18); lateral flanges well developed and protruding distally; gnathos with paired, sclerotized, subovoid processes proximally placed; saccus short and curved. Valvae long, distally crenulate and crinose, bent upward; left valva (Fig. 21) with ampulla variably dentate, saccus with harpe squared, deeply divided to a short crenulate process; right valva (Fig. 18) curved and evenly dentate; ampulla rounded ventrally and concave dorsally, deeply crenulate, saccus with harpe curved dorsally and pointed; aedeagus long, broad and curved; juxta saddle-shaped.

Female (Fig. 10). As in male but forewing slightly more convex, length 21-23 mm; hyaline spots and yellowish spots generally larger; hindwing more convex.

Female genitalia (Fig. 23). Papilla analis long, craticular and crinite with apophysis long and slightly curved; lamella post-vaginalis broadly divided and straight with rounded tips; lamella ante-vaginalis broad, irregularly depressed centrally; ductus bursae and caudal chamber narrow; corpus bursae long, ovoid with spherical accessory pouch.

Variation. Very little variation has been observed from the limited material available. Adults differ slightly in size and size of maculation.

Etymology. Taori is an aboriginal word for country, territory or hunting ground, especially for limited natural boundaries such as mountains, ridges and rivers.

Distribution. Recorded from Expedition Range and Isla Gorge, with one observation at Springsure in the Central Highlands, Central Queensland. Similar habitats occur widely throughout the sandstone rangelands from

Robinson Gorge National Park, Mount Moffatt, Carnarvon Ranges and possibly west to the Salvator Rosa National Park. It may occur also in northern Queensland.

Life histories and biology

Trapezites genevieveae

Larval foodplant. *Lomandra spicata* A. Lee, occasionally *Lomandra hystrix* (R.Br.) L. Fraser & Vick. and possibly *Lomandra longifolia* Labill. (Xanthorrhoeaceae).

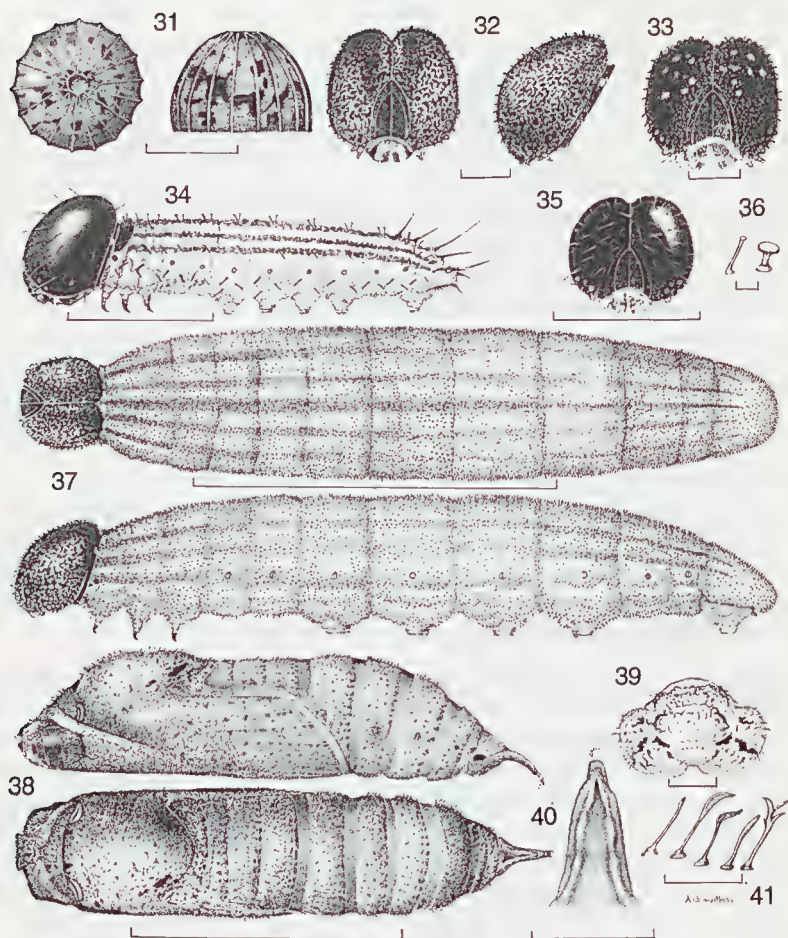
Egg (Fig. 31). Diameter 1.5 mm, hemispherical, with 17-20 prominent vertical ribs; off-white to pearl coloured and unmarked when first laid, creamish-white with pink micropyle and scattered pattern of lateral markings developing after 2-3 days.

Larva. 1st instar (Figs 34, 35). Length 3 mm, head shiny black and covered lightly with long setae, prothoracic plate brown; body straw-coloured, longitudinally striped with reddish dorsal, subdorsal and lateral bands and covered with short, slightly clubbed setae; longer plain setae on posterior segments.

2nd-5th instars (Figs 32, 37). Length 5-45 mm. Head pinkish-brown mottled with darker rugose markings on lateral and basal areas, dorsal area covered with short cup-shaped setae (Fig. 36); body greyish-fawn to pinkish-brown covered with dark brown speckled markings that form dorsal, subdorsal and lateral bands, darker on anterior and posterior segments.

Pupa (Fig. 38). Length 20-22 mm, cylindrical, tapering moderately to fairly long, decurved cremaster (Fig. 40) with rounded tip; frons pale brown, sclerotized with two central and two dorsal slightly raised areas; body pale pinkish-brown mottled with darker small brown markings, larger on dorso-posterior of thorax and two prominent brown dorso-anterior markings on thorax; covered with short, slightly branched, flattened or simple setae (Fig. 41); anterior covered with whitish waxy powder.

Biology. The egg is laid at the base of the foodplant or on surrounding leaf litter and hatches after 10-15 days. The young larva develops slowly in autumn and winter, eating at first from the edges of new foliage. Later instars cut distinctive oblique slices across the leaf-blade. The final instar larva constructs a lightly woven shelter amongst ground debris of damp, rotted and mouldy leaves and twigs. A diapause of the final instar larva occurs late September/October to November (lasting 6-9 weeks) when feeding is discontinued until pupation. Larvae and pupae are a distinctive pale pink to light brown colour. The pupation site is usually in the final larval shelter, which may be a metre or more from the foodplant. Adults emerge in 12-20 days.



Figs 31-41. Life history of *T. genevieveae* from Barrington Ranges, NSW (and comparative larval head of *T. maheta* from Byfield, Qld): (31) dorsal and lateral view of egg; (32) frons and lateral view of final instar larval head; (33) frons of larval head of *T. maheta*; (34) 1st instar larva; (35) frons of 1st instar; (36) mature larval setae; (37) dorsal and lateral view of final instar; (38) lateral and dorsal view of pupa; (39) operculum of pupa; (40) cremaster of pupa; (41) pupal setae. Scale bars (36, 41) = 0.5 mm; (31-35, 39-40) = 1 mm; (37-38) = 10 mm.

T. genevieveae is confined to dense 'old-growth' primary subtropical and temperate rainforest, particularly in montane biomes at altitudes between 200-800 m. Typical habitats include dense canopy forests in valleys, ravines, rocky riverine gorges and sheltered slopes dominated by 50-60 m tall hardwoods of *Eucalyptus grandis* (Flooded Gum), *Eucalyptus saligna* (Sydney Blue Gum), *Eucalyptus microcorys* (Tallowwood) and many other trees such as *Archontophoenix* (Bangalow Palm) and *Livistona* (Cabbage Palm). The skipper also extends into upland temperate rainforests. The ground cover in these habitats is often sparse with *Lomandra spicata* the principal herb, a medium-sized tussock that grows locally in dark, damp undergrowth areas and often on rocky slopes bordering streams.

Adults are rarely observed. They fly mostly around the sunny openings of the upper or mid-canopy, males choosing perching and patrolling sites during the day. In the early morning and late afternoon both sexes often settle low in sunlit glades or visit *Lantana* flowers. The species is univoltine, the adults fly only in the warmer, wetter months between November and March but appear to be most abundant in early December (pers. obs. in field and from reared specimens).

Colonies of juveniles can be detected by web trails and the distinctive fresh oblique cuts to the leaves of the foodplant but during the diapause (final instar) phase the larvae are difficult to detect, due to the absence of fresh feeding signs and the distance of the prepupal shelter site from the foodplant. At Mount Cordeaux (Cunningham's Gap, Qld), final instar larvae can be detected by fresh feeding signs in October at higher altitudes above 700 m. It is not clear if individuals at this altitude have a shorter diapause and/or a slower metabolism than specimens at lower altitudes. In some rainforest areas (e.g. Bruxner Park and Comboyne Plateau, NSW, Montville, Qld) the foodplants appear to include *Lomandra hystrix*, a riverine plant widely distributed in eastern Queensland and north-eastern New South Wales.

Lomandra spicata is easily recognised by the decorative bright orange seeds and soft, dark green foliage. It is not uncommon but local from sea-level to 900 m, restricted to colonies scattered through the dark floor of primary rainforest. It also reaches into subalpine Beech (*Nothofagus*) forests at the Barrington and Border Ranges and also in littoral rainforest and coastal vine-forest (eg. Booti Booti National Park, NSW) but *T. genevieveae* appears to be absent from these climatic extremes. *Lomandra spicata* is also recorded from the Atherton Tableland, north Qld and further south on the border at Mt Lindsey, Mistake Range and Whian Whian State Forest (Lee and Macfarlane 1986).

Trapezites taori

Larval foodplant. Not recorded but probably *Lomandra* sp. (Xanthorrhoeaceae). There are at least seven species in the area, including *L.*

longifolia and *L. multiflora*. Reared larvae fed on several species of *Lomandra*.

Egg (Fig. 42). Diameter 1.2 mm, pale green to yellowish; reddish-brown patches appearing on dorsal and lateral areas on third day.

Larva. 1st instar (Figs 45-46). 3 mm long; head shiny black with several pale setae on dorsal and lateral surfaces; body straw-coloured with one dorsal and 6 dorsolateral, longitudinal reddish stripes, covered with dark, medium clubbed setae; four pairs of long setae on posterior segments.

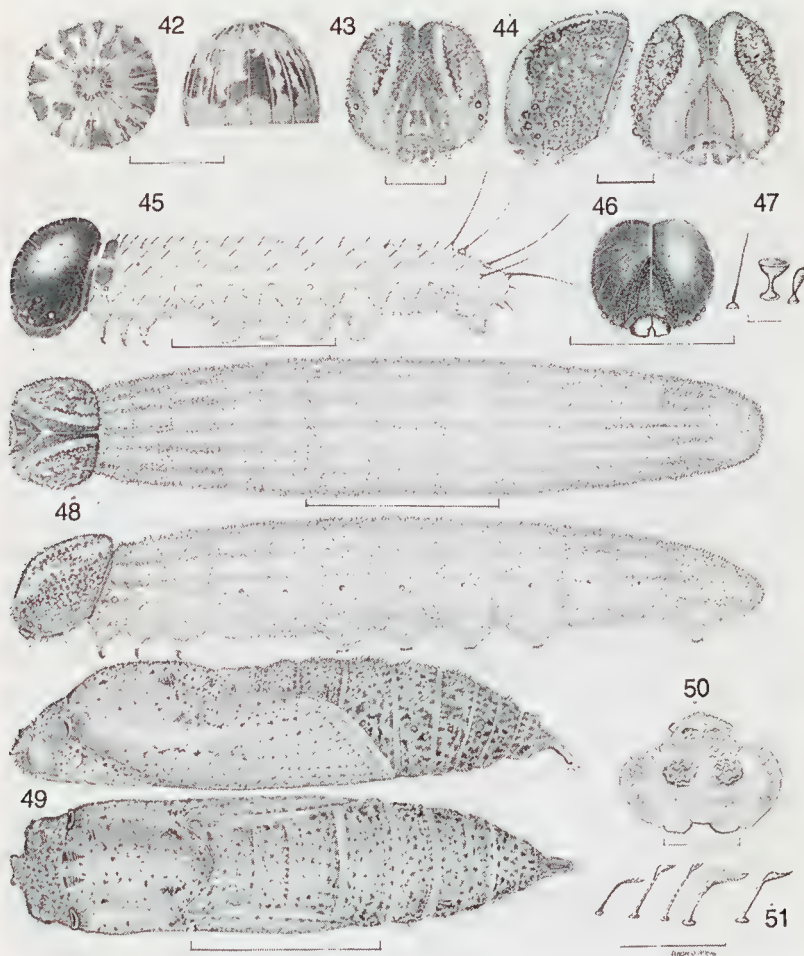
2nd-4th instar. 10-15 mm long; head sclerotized, brown to dark brown; paler markings (variable) on dorsal area forming an upturned Y-shaped marking centred by a dark area to frons, grooved dorsally; body translucent grey-green to purplish-pink at anterior and posterior segments; a series of 7 dark grey-green and 5 pale green dorsal and dorsolateral, longitudinal bands.

Final instar (Figs 43, 48). Length 39-41 mm; head moderately sclerotized, dark brown with lighter brown maculation on lateral surfaces and inverted V-shaped marking at frons; body translucent greyish-green covered with short pale spinules (Fig. 47), a dark dorsal line along length of body and two dark dorsolateral lines on anterior segments.

Pupa. Unknown, but probably similar to that of *T. symmopus* (Figs 49-51).

Biology. Oviposition by captured females was on both the foodplant and litter substrates. Juveniles and the larval foodplant of *T. taori* have not been discovered in the field, but caged larvae readily accepted *L. longifolia*, *L. hystrix* and *L. spicata*. Unlike *T. genevieveae* but like *T. symmopus*, the larva grows steadily without apparent diapause, eating at dusk and sometimes at dawn, the feeding sites being erratically chosen from the edges of several leaves each night. Maturity was reached by March and April from eggs laid in September. The larvae are similar to those of *T. symmopus* but the head is darker with a narrow pale band, the body more translucent and banded. As in other species, the larval shelters are silk-woven leaves of the foodplant (especially early instars) and leaf-litter near the base of the plant. It is expected that pupation takes place in the final instar shelter. Reared larvae (n=22) all eventually succumbed to a devastating virus brought in on a batch of *T. phigalioides* larvae from the Grampians, Victoria, although *T. symmopus* larvae from Eungella Range, Qld, remained unharmed. The pupa, operculum and pupal setae of *T. symmopus* are illustrated (Figs 49-51), which hopefully may assist in the discovery of the pupa of the closely allied *T. taori*.

Adults of *T. taori* fly powerfully and rapidly 2-3 m above the ground. In the early morning adults sun themselves on stones and low vegetation in open sandy patches of heathland. Later in the morning and in late afternoon both sexes are attracted to flowers, particularly *Xanthorrhoea johnsonii* A. Lee, *Leptospermum flavescens* Sm. in spring and *Banksia oblongifolia* Cav. in autumn. Males have been observed patrolling 'territories' in clearings of



Figs 42-51. Life history of *T. taori* from Blackdown Tableland, Qld (and comparative larval head and pupa of *T. symmomus* from Dudley, NSW); (42) dorsal and lateral view of egg; (43) frons of mature larval head; (44) lateral and frons view of mature larval head of *T. symmomus*; (45) 1st instar larva; (46) frons of 1st instar larval head; (47) mature larval setae; (48) dorsal and lateral view of mature larva; (49) lateral and dorsal view of pupa of *T. symmomus*; (50) operculum of *T. symmomus*; (51) pupal setae of *T. symmomus*. Scale bars (47, 51) = 0.5 mm; (42-46, 51) = 1 mm, (48-49) = 10 mm.

woodland near ridges, settling on low vegetation. *T. taori* flies with *T. phigalia* (Hewitson), *T. eliena* (Hewitson), *T. maheta* and *T. petalia* (Hewitson) but has a stronger, more elevated flight than these species.

Discussion

Trapezites genevieveae

Originally considered subspecies of *T. maheta*, Waterhouse (1912) raised both *T. iacchoides* and *T. phigalioides* to specific level following the discovery that their distributions overlapped in New South Wales. Sands *et al.* (1984) further raised *T. maheta praxedes* to specific rank after observing that both *praxedes* and *maheta* are sympatric in southern Queensland and northern New South Wales.

The type locality of *T. praxedes* is regarded as Port Jackson (Sydney, NSW) (Waterhouse 1932a). It is distributed from southern Queensland (Fraser Island [pers. obs.] and Cooloolo [Sands *et al.* 1984]), south through coastal New South Wales to East Gippsland, Victoria (Common and Waterhouse 1981). A specimen listed by Dunn and Dunn (1991, '50 km S of Sarina') in M. De Baar collection is in fact a female *T. maheta* (pers. obs.). The type locality of *T. maheta* is Brisbane, Queensland (Waterhouse 1937) and this taxon occurs from northern New South Wales to northern Queensland (Dunn and Dunn 1991).

T. genevieveae taxonomically is closely allied to and not easily distinguished from *T. praxedes* unless the comparative adult specimens are fresh and unworn. The fore and hindwings of both sexes are slightly more distally pointed than those of *T. praxedes*. Southern specimens of the latter are distinctly smaller (Figs 1-2; average male forewing length = 15 mm; female = 17 mm). All specimens of *T. genevieveae* have a suffused broad area of pale yellow scales along the inner margin of the underside of the forewing, which is prominent in females but variable in extent in males. The underside of the hindwing in males possesses at least one extra silver subterminal spot (usually two or more) in the apical area, but in *T. praxedes* males these subterminal spots are diffused black, rarely centred with a few silver scales. The row of dark subterminal spots on the underside of the hindwing in females are often centred with white scales; these are never so in *T. praxedes*, the females of which have these spots centred dull grey. In both sexes of *T. genevieveae* the general ground scaling of the underside of the wings is various shades of brown and purplish-brown; in *T. praxedes* it is shades of dark grey or pure-grey (the latter colour especially in northern specimens [Fig. 11]).

The males of both species differ from *T. maheta* (Fig. 5) by the shape of the wings and the size, shape and position of the silver spots. Both sexes of *T. maheta* have only a slight suffused pale yellow inner margin on the underside of the forewing and the females (Fig. 6) lack the white-centred spots of the

undersides. Both sexes of *T. maheta* have stout bodies and shorter, more rounded wings and a more yellowish-grey appearance on the underside.

Larvae and pupae of *T. genevieveae* are paler than that of the two comparative species, neither of which have a larval diapause and are multivoltine in areas of sympatry. Larvae feed from 21h00 to 24h00 (EST).

T. praxedes is found in heaths, dry woodlands and open wet sclerophyll forests that support a dense heath-like ground cover. It is multivoltine, or in the southern part of its range at least bivoltine, flying throughout the warmer months, particularly during spring and autumn. By contrast, adults of *T. genevieveae* are found only in rainforest in mid-summer. The foodplants of *T. praxedes* are soft species of *Lomandra*, principally *L. obliqua* (Thunb.) J.F. Macbr., a generally prostrate fine-leaved creeper. *T. maheta* flies throughout the warmer months (particularly in spring and autumn) in mixed woodlands, rangeland riverine forests and Wallum heathlands. I have found larvae of this species on *L. hystrix* at Byfield, central Qld.

Probably the first specimen of *T. genevieveae* was collected in January, 1911 by R.J. Tillyard at Dorrigo, in northern NSW (Waterhouse and Lyell 1914, 1 male now in NMVM [M.F. Braby, pers. comm.]). Other specimens were collected by H. Sibatani in the summer of 1967-68 near Coffs Harbour, NSW. These specimens (presumably in Sibatani's collection) were the subject of a paper (Sibatani 1970) dealing with a curious male aberration (collected in December, 1968 and now in ANIC) found in rainforest at Bruxner Park. I have collected and reared specimens (found on *L. spicata*) from the Dorrigo area and at Bruxner Park and confirm that these are *T. genevieveae*.

T. genevieveae and *T. praxedes* are sympatric in some areas where sclerophyll woodland and rainforest meet in mid-coastal NSW and near Brisbane, Qld but appear to be temporally isolated at these sites (pers. obs.). Specimens of both species have been collected and reared within 5 km of each other in the Brisbane hinterland (see Figs 27-28). A male of typical coastal *T. praxedes* (but with aberrant genitalia) was collected recently by A.S. Smithers in the Mt Royal area of the Barrington Ranges (Atkins and Smithers 1995). This is about 10 km from populations of *T. genevieveae* at Mt Allyn. These two species are also partly sympatric with *T. maheta* in the districts of Grafton and Busby Flat, NSW and probably north to at least the Nambour area, Qld.

Morphological differences in some populations of *T. praxedes* in northern NSW (see Figs 15-16, 28-29) require further study to determine if further speciation is occurring in this complex.

Trapezites taori

The type locality of *T. symmokus* is the Sydney area (Waterhouse 1932b, 1937). The two described subspecies, *T. s. soma* and *T. s. sombra*, occur in

Victoria and north Queensland respectively. The second largest species in the genus, *T. taori* resembles both *T. eliena* and *T. symmumus* but adults and juveniles are morphologically closer to the latter species. Its swift, elevated flight resembles that of *T. iacchoides*. *T. taori* is bivoltine and appears to be restricted to the drier sandstone vegetation communities of mixed heath and woodlands of the central highlands.

T. symmumus is found in woodlands and heaths with a moderate to high rainfall. It occurs at Kroombit Tops, 130 km SW of Blackdown Tableland. It is normally univoltine (eg Kroombit Tops, Eungella Range and Atherton Tableland, Qld), flying in the warmer summer months in montane areas or in autumn in the southern coastal areas. Dunn and Dunn (1991) recorded a bivoltine brood in southern coastal Queensland and adults have been recorded in October at Broken Heads and Toormina, northern NSW (pers. obs.).

Sexual dimorphism is not obvious in adult *T. taori*. The adult is somewhat smaller than *T. symmumus* (Figs 7-8, 12), less angular in shape (especially males) and more muted in colour. The male genitalia are distinctly asymmetric (Figs 18, 21) and the lateral processes of the uncus are smaller than in *T. symmumus* (Figs 19-20). The female genitalia (Fig. 23) have a quadriform, broadly divided post-vaginalis and not a spreading V-shaped process as in *T. symmumus* (Fig. 24).

Taxonomically *T. taori* is less specialised than *T. symmumus* and links with the *phigalioides/ maheta/ praxedes/ genevieveae/ iacchoides* section of *Trapezites*.

Conservation

Trapezites genevieveae and *T. taori* are uncommon to rare species, undoubtedly having avoided previous detection by their similarity to closely related 'sister-species', their cryptic habits and specialised habitat selection.

T. genevieveae is a vulnerable 'refugia' species recorded from disjunct old-growth rainforest localities. Clear-felling of timber in these habitats outside National Parks would further isolate the species. Recent larval feeding signs on foodplants in some localities such as Nightcap Range and Tallowood Forest indicate that the skipper is able to recolonise selectively logged areas, providing that there are corridors of dense rainforest and sufficient regrowth older than 30 years (pers. obs.). It is likely that more populations will be found within the known range (especially in the upper catchments of the Hunter, Manning, Hastings, Clarence and Richmond River systems) and perhaps further afield in Queensland.

The present known distribution of *T. taori* is extremely restricted and it appears to be rare. Isla Gorge is an exposed, dry locality and, together with Expedition Range and Springsure, is subject to intense seasonal bushfires and irregular rainfall. The species' bivoltine life cycle would probably facilitate

rapid recovery from fires and droughts provided that these are scattered or infrequent. This species may also have a wider distribution than presently known.

It is clear that more distributional and biological data are required before conservation measures are developed. All species in the genus are vulnerable to land disturbance and populations rapidly become extinct as a result of commercial and agricultural development. Existing populations of these two new skipper butterflies should be monitored closely by amateur and professional entomologists.

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